

The Commission Should Act Promptly

Because interconnection is vital to the development of local competition, it is important for the Commission to impose reasonable interconnection rates as promptly as possible. Every day of delay also delays the time when the public will obtain the benefits of full competition. The Commission has the tools to act quickly and should not wait for other matters to be completed before adopting sound interconnection rules.

The Commission has a good vehicle for action in its pending CMRS interconnection proceeding. This proceeding has a strong record that would permit the Commission to make the necessary public interest findings to adopt bill and keep for CMRS-to-LEC interconnection. This proceeding also provides the perfect opportunity for the Commission to adopt an interconnection model for the states to emulate. If, however, the Commission believes that it needs more information, it could issue a short notice of proposed rulemaking to address those issues on which a more complete record would be helpful. If the notice were tightly focused on the core issues, it could be released promptly and could permit the Commission to act swiftly once comments are received.

The Commission should not delay action on interconnection to await the resolution of other matters. For instance, there is no reason to wait for the resolution of universal service issues before considering interconnection. While universal service issues are important, they are separate from interconnection. Some have argued that the emergence of competition will affect the ability of incumbent carriers to meet universal service needs. In practice local competition is unlikely to have any negative effect on universal service for years to come. In fact, it could even have a positive effect as cable operators and others move to enter residential and rural markets. Similarly, interconnection for local service and access charge reform should be considered on separate tracks because access charges are, by definition, not related to local telephone service, but are incurred only for interexchange service.

There also is no reason for the Commission to wait for Congress to act on the pending telecommunications legislation. The legislation will give the Commission a broader role in interconnection issues, but the Commission already has the jurisdiction to address, at a minimum, CMRS interconnection issues. As is the case for number portability, the Commission actually can get a head start on the proceedings required by the legislation if it acts now. Moreover, acting now on interconnection will be even more beneficial if the legislation is not enacted because Commission action will be vital in the absence of direction from Congress.

ISSUE UPDATE: INTERCONNECTION AND COMPENSATION

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by
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This issue update is intended to be a companion to "The Economics of Interconnection" three papers on key aspects of the interconnection compensation issue authored by Gerald W. Brock' and published as a collection by TCG in April 1995. For the benefit of those who have not had the opportunity to read these papers, they are attached.

In the three papers, Mr. Brock explains how reciprocal compensation arrangements that are administratively simple, economically correct and consistent with maximum network efficiency would arise in a competitive marketplace. He also explains why regulators must guide a previously monopolized market in transition to competition towards an economically correct interconnection compensation system and why such regulation must limit compensation to no more than the incremental cost of the peak period capacity required to terminate the traffic. Because such an incremental cost is so trivial, he also suggests why a zero-priced interconnection ("sender keep all" or "bill and keep"), such as has been agreed to by commercial service providers on the INTERNET, meets these economic requirements.

INTRODUCTION AND SUMMARY

Competing local exchange carrier (LEC) networks must be seamlessly interconnected to avoid a repeat of the situation, which existed at the turn of the century, when local exchange service was competitive and unregulated but consumers had to bear expense and inconvenience of having to subscribe to two or more telephone systems that did not connect, in order to reach all the parties they wanted to talk to.

"Seamless interconnection" means more than simply physically interconnecting competing local exchange carriers' networks. It also means that the competing local exchange carriers must establish the administrative and financial arrangements necessitated by the exchange of calls between their competing networks. And the single most critical issue is the establishment of a system by which each LEC will be compensated

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for terminating local telephone calls originated on another, competing LEC's network: one compensation system will promote vigorous local exchange competition that strongly benefits all consumers; another system will stifle competition or, perhaps worse, create only the illusion of competition that results in a virtually deregulated monopoly.

If the traditional, mature LECs and the emerging, start-up competitive LECs cannot negotiate a mutually acceptable compensation system, as seems likely, regulators will have to decide the issue and do so quickly. Their selection of one system or the other will largely determine whether effective local exchange competition will be economically viable, or not.

If local exchange competition is economically viable, then competition can safely be substituted for regulation and substantial changes in the regulation of the traditional local telephone industry can and should be made. But if the interconnection compensation system does not allow for economically viable local exchange competition, then the result, eventually, will be greater regulation of the telephone monopolies and the loss to this country of the economic and social benefits of a vigorously competitive market.

Which system should be adopted? Which system will be adopted?

INTERCONNECTION COMPENSATION IS A CRITICAL BUT TEMPORARY ISSUE CAUSED BY UNBALANCED TRAFFIC AND THE LACK OF NUMBER PORTABILITY

The transitional problem facing local exchange carriers and their regulators is that, in the near and medium term, the traffic exchange between immature, start-up Competitive LECs (CompLECs) such as TCG and the mature, Traditional LECs (TLECs) that have market power and all of the customers will be substantially imbalanced. In the period of imbalance, the CompLECs will terminate substantially more traffic on the TLECs' networks than the TLECs will terminate on the CompLECs' networks.

To attain a reasonably balanced exchange of traffic with a TLEC, a CompLEC must serve a customer mix that is similar to the TLEC's. This means, for example, that CompLECs would have to serve a full range of customers with predominantly outbound

usage, as well as a full range of customers with predominantly inbound usage. But without effective, efficient number portability, CompLEC's will be discouraged from seeking "inbound customers" (compounding the traffic imbalance problem) and some consumers will be discouraged from subscribing to the CompLECs' outbound service.

Regulators must recognize that Service Provider Number Portability ("SPNP") is a prerequisite to the natural "balanced traffic" that characterizes mature interconnection relationships and should therefore insist that effective, database-driven Service Provider Number Portability be in place before they give serious consideration to permitting the usage-sensitive compensation systems advocated by some TLECs.

Time is required to allow CompLECs to mature in the marketplace. And time is also required to develop a database-driven SPNP system needed to allow consumers with substantial inbound traffic to be served efficiently by CompLECs.

In summary, as the traffic between a CompLEC and TLEC becomes reasonably balanced as the result of the natural maturation of the CompLEC and the availability of SPNP, interconnection compensation will become a "non-issue" because any charges that are assessed reciprocally will cancel out. But will CompLECs have a reasonable opportunity to mature? The answer is, only if the substantial ~~short-term~~ reciprocal compensation problem is resolved immediately.

CONFLICTING APPROACHES TO INTERCONNECTION COMPENSATION

Mature traditional local exchange carriers and the emerging, start-up competitive LECs are proposing mutually exclusive compensation models. If the carriers cannot come to negotiated agreements, regulators will have to choose between them. The alternatives are:

- **USAGE-SENSITIVE**

TLECs are proposing usage-sensitive schemes (i.e., minutes-of-use), often based on the existing "switched access charges" imposed as a matter of public policy on the

termination of interexchange carriers' long distance traffic. Since the interexchange access charges are by design "uneconomic", it follows logically that a usage-sensitive system would tend to maintain the status quo, advantaging the incumbent dominant LECs and disadvantaging the new entrants.

● **USAGE-INSENSITIVE**

TCG and other actual and potential CompLECs are proposing usage-insensitive compensation systems, either "bill and keep"² or flat-rated capacity charges³ or some combination of the two. (A "bill and keep" arrangement can be thought of as a "zero priced" flat-rate capacity charge.) Because any costs incurred by TLECs to terminate CompLECs' traffic are both trivial and not related to usage, a usage-insensitive compensation system would be "economic" and encourage a more competitive local telecommunications marketplace.

It is obvious that CompLECs will not start out with the extensive networks and customer base of incumbent LECs. It will take a considerable period of time for CompLECs to develop their networks and build their customer base, particularly in the absence of Service Provider Number Portability. To establish the effective, sustainable competition that would justify and perhaps require substantial changes in the regulation of TLECs, regulators must ensure that interconnection compensation systems favor "competition" (not a particular competitor) and that they are based on sound economic and policy principles.

Establishing an appropriate mechanism and level of compensation between competing local carriers is critical for the development of competition. Thus, regulators should evaluate each of the basic proposals on the basis of whether it satisfies the following criteria:

² "Bill and keep" (or "sender keep all") refers to a system whereby each carrier reciprocally terminates the other carriers' traffic for no explicit charge so that the originating carrier "bills" the originating subscriber and "keeps" all of the billed revenue.

³ In a "capacity charge" compensation system, the carrier originating a call terminates it through a fixed amount of switching capacity (i.e., a DS1 switch port) at fixed monthly charge.

- creating an environment that encourages viable local competition;
- encouraging innovative retail pricing;
- favoring administrative simplicity and low administrative cost; and
- encouraging investment in, and the development of, a rugged, disaster-resistant local telecommunications infrastructure.

As explained more fully below, CompLECs' various usage-insensitive proposals generally satisfy all these criteria. By contrast, the TLECs' usage-sensitive proposals would thwart effective, sustainable competition because they are inefficient, administratively burdensome, and prevent economically viable competition.

USAGE-SENSITIVE INTERCONNECTION RATES CAN'T WORK IN A COMPETITIVE LOCAL MARKET

Usage-sensitive interconnection rates will not encourage the sort of vigorous competitive market that benefits consumers. Rather, at best (or at worst, depending on one's viewpoint), they would allow the TLECs to create just enough of an illusion of competition to justify their demand for radical changes in the regulatory system. That is because usage-sensitive interconnection would set the CompLEC's price floor, constrain the new entrant's ability to devise innovative pricing plans, and transfer all the economic benefit of any CompLEC marketing success to the TLEC. Regulators should not settle for such an illusion of competition; they must encourage the reality of vigorous, sustainable competition.

To illustrate the issue, consider the case of Oregon. Local exchange telephone service in Oregon is provided under almost every type of rate plan used elsewhere in the country: both usage-sensitive and flat-rate/unlimited use retail rates are available with optional volume discounts to both business and residential consumers. And US WEST's proposed interconnection compensation for Oregon is typical of TLEC proposals for a usage-

sensitive call completion rates. Therefore, while the circumstances in each State are unique and must be taken into account, Oregon provides an excellent framework for examining the full range of interconnection compensation issues. As the following analysis of US WEST's compensation interconnection proposal demonstrates, it, like other such usage-sensitive systems, is uneconomic, unworkable and anticompetitive.

Under its proposal, US WEST would impose a charge of 2.0 cents/min. for terminating local exchange calls originated by CompLECs. This 2.0 cents/min. rate is uneconomic and unreasonable because it is probably at least 10 times higher than the incremental cost.⁴ Such high usage-sensitive rates make it impossible for a CompLEC to economically address any market segment, as the following examples illustrate:

● Competing for Small and Medium Business Users

Small businesses in Portland have two options: they can purchase a measured rate complex business line for \$18.00 per month plus 3 cents/min. for local exchange calls, or they can purchase a line with unlimited local calling for \$34.77 per month.

It has been estimated that about 10 percent of Portland's business lines are measured rate. Upon first impression, it appears that CompLECs would have a 1 cent/per min. gross margin when competing for measured rate service users at the proposed 2.0 cent/min. interconnection rate. But this margin is illusory: most of the businesses that choose measured service use discount calling plans based on the number of minutes of use per month on each line. The plans for 6, 9, 12, and 18 hours of usage drop the average marginal rate of a local call below the proposed interconnection rate (to 1.47 cents/min. for 6 hours; 1.65 cents/min. for 18 hours).

⁴ See, Brock, "Incremental Cost of Local Usage," where it is noted that studies done by or supported by TLECs indicate that 0.2 cents/min. is a reasonable estimate of a TLEC's average incremental cost of terminating a CompLEC's traffic. It is also noted that the cost is determined by peak period capacity and therefore the true cost is considerably higher than the 0.2 cents/min. average during the peak period and is zero during the non-peak period.

It has been estimated that more than 90% of the business lines in Portland are purchased on a flat-rate basis with unlimited local calling and it is likely that most of these lines are used by "medium" sized businesses. To address this substantial market, CompLECs will need to offer a flat rate/unlimited use option.

The \$16.77 difference between the measured rate line (\$18.00) and the flat rate service (\$34.77) is the price to purchase unlimited local usage. Table 1, below, compares the effective calling rate per minute for business customers purchasing the flat rate/unlimited use service with the proposed 2.0 cents/min. interconnection charge. In every instance, CompLECs are left with negative operating margins. In other words, under the TLEC's proposal, even before the CompLECs address their own costs of providing service, they would lose money if they tried to match the TLEC's effective calling rate.

TABLE 1 (COMPETING FOR MEDIUM BUSINESS USERS WITH FLAT RATE, UNLIMITED USE SERVICE)

<u>Local Calling Mins./Month</u>	<u>Effective Calling Rate per Minute</u>	<u>Proposed Interconnect Rate</u>	<u>CompLEC's Margin</u>
900	1.86	2.0	(0.14)
1000	1.68	2.0	(0.33)
1100	1.52	2.0	(0.48)
1200	1.40	2.0	(0.60)

All per minute values expressed in cents.

Effective Rate per Minute = \$16.77 / Local Minutes per Month

Operating Margin = Effective Calling Rate - USWC Proposed Inter-carrier Compensation rate.

● **Competing for Large Business Users**

In Oregon, low cost local calling is available for large business users (those with digital PBXs) through the TLEC's Digital Switched Services ("DSS"). The following chart shows the market realities faced by prospective CompLECs in that market, which is initial "core" market for CompLECs:

DS1 Charge:	\$150.00
24 Outbound	
Advanced Trunks (\$23 each):	\$552.00
<u>EUCL Charge (\$6 each):</u>	<u>\$144.00</u>
Total Monthly Charges:	\$846.00

A large business customer using these services would typically generate a total usage of about 160,000 minutes per month per DS1. This would yield an effective local calling rate of 0.529 cents/min (\$846.00/160,000 mins), meaning that a CompLEC would lose 1.471 cents/min. (and probably more since the CompLEC may have to offer lower retail rates to attract the large user in the first place).

By making it impossible for CompLECs to compete for the large business users' traffic, the usage-sensitive interconnection scheme makes it impossible for CompLECs to achieve the capacity utilization factors needed for the CompLEC to be an active and effective competitor in the residential and smaller business markets.

● Competing for Residential Consumers

Residential users in the Portland area can purchase a measured service phone line from the TLEC at a monthly rate of \$6.37. They can also purchase 3- and 6-hour usage discount plans whose effective retail prices range from 1.27 to 1.33 cents/min., well below the proposed CompLEC call completion rate of 2.0 cents/min.

It has been estimated that about 90% of residential customers in Portland purchase flat-rate/unlimited use service, which they can obtain for \$12.80 per month. Thus, the customer can purchase unlimited local usage for \$6.43 per month -- the difference between the flat rate service (\$12.80) and the measured service phone line rate (\$6.37). Table 2, below, which assumes an average call duration of 5 minutes, provides some frame of reference:

TABLE 2 (COMPETING FOR RESIDENTIAL USERS WITH FLAT RATE/ UNLIMITED USE SERVICE)

<u>Local Calls Per Day</u>	<u>Local Minutes Per Month</u>	<u>Retail Rev. Per Min.</u>	<u>Proposed Interconnect Rate</u>	<u>CompLEC's Margin Per Min.</u>
3	450	1.43	2.0	(0.57)
4	600	1.07	2.0	(0.93)
5	750	0.86	2.0	(1.14)
6	900	0.71	2.0	(1.29)

Revenues, rate, and margin expressed in cents.

Local Minutes per Month = Local Calls per Day x 30 x 5

Retail Revenue per Minute = \$6.43 / Local Minutes per Month

Margin = Proposed TLEC Termination Rate - Retail Revenue per Minute

As Table 2 demonstrates, if CompLECs in Oregon had to pay 2.0 cents/min. to TLECs to terminate a local call, the CompLECs would not be able to compete for residential callers who make more than 2 calls per day.

In a jurisdiction with **mandatory** measured use for ALL classes of users, it might be possible to devise usage-sensitive interconnection compensation rates that provide for some "positive" margin between the TLEC's effective retail rates and the interconnection rates paid by the CompLECs. But this would defeat a major consumer benefit of local exchange competition: because such interconnection rates would parallel the TLEC's retail volume and time-of-day/day-of-week discounts, they would force CompLECs to become clones, not competitors.⁵

Usage-sensitive interconnection rates are even less workable in jurisdictions with mandatory or optional "flat-rate/unlimited use" local calling. The fundamental mis-match between a usage-sensitive wholesale rate and retail flat-rates would strongly discourage CompLECs from serving high volume customers, particularly INTERNET users and information services subscribers.

USAGE-INSENSITIVE INTERCONNECTION RATES WILL WORK IN AND ENCOURAGE A COMPETITIVE LOCAL EXCHANGE MARKET

In contrast to the TLECs' usage-sensitive proposals, the usage-insensitive arrangements advocated by TCG and other CompLECs are

⁵ Complex volume and time-of-day/day-of-week discounts in the interconnection rates would impose substantial measurement, billing and reconciliation problems and costs on both carriers.

likely to establish the basis for a competitive local telecommunications market that strongly benefits all consumers.

- **Usage-insensitive compensation is fair and appropriate where costs vary based on capacity, not utilization.**

All carriers make rather "lumpy" investments in switching and interoffice trunking capacity-based on peak busy hour forecasts. As Gerald Brock's "Economics of Interconnection" points out, the bulk of the TLECs' interconnection-related costs are incurred when termination capacity is created, based on peak load demands. And these investments in peak period termination capacity will be made regardless of whether the traffic is originated by a TLEC or a ComPLEC and regardless of any forecast off-peak usage levels. Consequently, there are few, if any, incremental facility costs associated with terminating a ComPLEC's peak period traffic⁵ and there are virtually no variable costs associated with off-peak usage.

The usage-sensitive compensation schemes proposed by TLECs so substantially overstate the cost of completing calls at most times of the day that they could not satisfy the "just and reasonable" test of general public utility law and policy.

By the same token, a usage-insensitive compensation system, which fully compensates a carrier for all of the net incremental costs incurred in making peak period capacity available, clearly would be just, reasonable and, because it encourages effective -- not illusory -- competition, in the consuming public's interest.

- **Usage-insensitive compensation allows ComPLECs to offer aggressive and innovative retail pricing to consumers**

"Bill and keep" or, to a lesser extent, capacity charges based strictly on incremental costs, afford ComPLECs the

⁵ Vigorous price, promotional and quality competition between ComPLECs and TLECs could stimulate additional total traffic volume and require some additional capacity. However, ComPLECs will be providing much of the additional total capacity required by the total "network of networks" so that TLECs will also enjoy some avoided costs.

freedom to introduce the innovative pricing plans that are a hallmark of a competitive market.

Each carrier in the competitive market must be able to independently develop its retail price strategy, including time-of-day and volume discounts in a measured use environment or different plans in a flat-rate retail environment. Such innovation and competitiveness is not possible in an environment where the dominant carrier is allowed to impose per-minute interconnection charges that set an effective price floor for "competitors".

With usage-insensitive interconnection, it will be more difficult for TLECs to control CompLECs' rate levels or to force CompLECs to clone the traditional rate structures. Rather, CompLECs would have the freedom to price their services in a manner that responds to consumers' preferences and, thereby, to maximize their volume and revenue.

- ***Usage-insensitive interconnections are much simpler and less expensive than usage-sensitive arrangements.***

Usage-sensitive interconnection charges will require complex and costly measuring, recording, and billing capabilities that few local exchange carriers possess today. Indeed, there is a question as to whether some TLECs currently even have the technical capability to measure terminating local exchange traffic. (Terminating local exchange traffic coming from a CompLEC will not trigger the TLEC's measuring system that is used to record terminating traffic.)

In any case, it is likely that the costs of measuring, billing, collecting and reconciling interconnection compensation are so high relative to the cost of providing the underlying service, that -- absent an anticompetitive intent -- it makes good business sense to avoid these costs altogether. The "bill and keep" arrangements proposed by TCG and other CompLECs does just that.

In fact, testimony filed in a pending interconnection compensation case in Washington State notes that US WEST's own cost studies demonstrate that the costs of measuring, billing and collecting inter-carrier compensation exceed the

costs of terminating local calls at the end office. Although this cost may differ somewhat in other States, it demonstrates, at the very least, that billing and administrative costs are significant relative to the incremental costs of the switching itself.

And if "bill and keep" is not adopted for some reason, flat-rate capacity charges are almost as easy and inexpensive because they entail only one monthly measurement of traffic (to allocate expenses on two-way interconnection trunks) and counting a few physically identifiable, permanent facilities (i.e., switch ports). Moreover, capacity charges represent a good transitional vehicle to a "bill and keep" arrangement that would naturally occur when traffic between carriers is balanced.

In summary, for the reasons outlined above, local exchange carriers should compensate each other by terminating each others' traffic on a usage-insensitive basis.

COMPENSATION SYSTEMS CAN MAXIMIZE DISASTER AVOIDANCE AND ENCOURAGE INFRASTRUCTURE INVESTMENT

Public policy should encourage the evolution of a public switched telecommunications network which is as resistant as reasonably possible to catastrophic service outages caused by natural and man-made disasters and accidents. Such disaster resistance is produced by avoiding "single points of failure" and maximizing switch and transmission facility diversity.

In a usage-sensitive interconnection scheme, it is likely that the price of interconnection at a TLEC's tandem switch would be higher than the price of interconnection at the end office. (Such two-tier pricing is used for interexchange access services.) If the tandem-end office differential is large enough, CompLECs would have an incentive to interconnect more at the end office and less at the tandem. From a public policy perspective, this is probably a desirable result since it would increase the physical diversity and therefore the disaster resistance of the public "network of networks": a catastrophic outage at the TLEC tandem would have less impact on the overall network and CompLECs would deploy diverse transmission facilities that could provide

route redundancy on inter-switch trunks for both ComLECs and TLEC.

However, a usage-insensitive system -- whether "bill and keep" or "capacity charges" -- which applies equally at both the end office and the tandem would sacrifice this public benefit: it could encourage ComLECs to over-rely on the tandem interconnection and it would not encourage ComLECs to build diverse facilities to the proximity of more TLEC end offices, thereby minimizing ComLECs' contribution to the overall telecommunications infrastructure.

The best way to encourage a more diverse and disaster-resistant "network of networks" is not to impose a usage-sensitive interconnection compensation system. Rather, the solution is to graft the one redeeming feature of the usage-sensitive system onto the otherwise superior usage-insensitive system. A usage-insensitive system can be adapted to provide ComLECs with an incentive to make greater use of "end office" interconnections with the TLEC by, for example:

- Having "bill and keep" at the end office and a flat rate capacity charge at the tandem. (The tandem capacity charge could be based upon the per minute cost of tandem switching and average tandem-end office transport and a typical utilization factor appropriate to DS1 inter-switch trunks. By way of example, in the pending Washington interconnection compensation case, based on US WEST's TSLRIC studies, this formula would yield a monthly flat-rate capacity charge for a tandem DS1 port of about \$130 using a utilization factor of 216,000 minutes per month.)
- Transitioning from mandated "bill and keep" to a cost-based interconnection (i.e., flat-rate capacity charges) at the tandem some number of years before such a transition occurs at the end office. (This transition period could begin when

database-driven Service Provider Number Portability becomes available so that CompLECs have a "reasonable" period in which to achieve the actual traffic balance that "bill and keep" emulates but cost-based interconnection would apply if the CompLEC was unable to achieve balanced traffic because of its own marketing decisions or other factors.)

The compensation system applied to the exchange of traffic between TLEC and CompLEC is not the only factor that will encourage or discourage the evolution of a disaster-resistant public switched network. The cost of the interconnection facilities -- the fiber optic cables or microwave links -- between the CompLEC switching center and the TLEC switching center will also play a very significant role in determining whether the public network will be vulnerable to disasters or not.

The cost of "collocation" arrangements (either physical or virtual) developed for special access and private line services make such arrangements totally inappropriate as the sole means of establishing the physical interconnection for local exchange service (although existing special access collocation arrangements should be used for local exchange service at the option of the collocating carrier). The high cost of collocation would strongly discourage end office interconnection and would therefore encourage a disaster-vulnerable network. Instead of collocation, CompLECs and TLECs should interconnect physically for local exchange service in the same way that adjacent TLECs currently do: over a shared, jointly constructed and paid for "meet point" facility with each carrier being responsible for the electronics at its end of the transmission facility.

With a "two-tier" interconnection compensation system that encourages end office interconnection and limiting the length a joint interconnection facility to a few miles, CompLECs would tend to extend their networks to the vicinity of TLEC end offices. This would establish the diverse transmission facilities that add disaster resistance to the overall public network.

"BILL AND KEEP" OR "CAPACITY CHARGE"?

As noted briefly at the beginning of this paper, TCG and other actual or potential CompLECs have proposed two types of usage-insensitive reciprocal compensation systems:

- "Bill and Keep", in which each LEC terminates the other's traffic for no explicit monetary fee in return for the reciprocal right to terminate its traffic also for no explicit payment.
- **Capacity Charges**, based strictly on the incremental cost of providing the units of peak period capacity made available to the interconnecting LEC.

A "bill and keep" compensation arrangement clearly has many benefits:

- **First**, it implicitly nets the trivial incremental costs associated with the carriage of the traffic during the period of substantial traffic imbalance against the relatively substantial billing and administrative costs which won't be needed once balance is achieved;
- **Second**, it is the simplest and least expensive system administratively, as no recording, or creation and payment of bills is required. (This has the additional benefit of eliminating conflicts between TLECs and CompLECs that would require arbitration by regulators.);
- **Third**, it allows CompLECs the greatest freedom and flexibility in designing innovative and competitive retail pricing plans so as to maximize the benefit to consumers; and,
- **Fourth**, it anticipates the development of the "balanced traffic" which is likely to occur if CompLECs have a reasonable opportunity to mature.

A flat-rate capacity charge (based strictly on the incremental cost of the peak period capacity) shares many of the fundamental advantages of a "bill and keep" arrangement; administrative costs will be a little higher, TLECs won't be able to complain about

not being compensated in cash and all the consumer benefits are preserved.

CONCLUSION

Regulators are being presented with a clear choice that will have profound consequences:

- They could choose the volume-insensitive reciprocal interconnection compensation systems being proposed by TCG and other prospective competitive local exchange companies to solve the **transitional problem** caused by relatively **temporary** traffic imbalances. If they do, it will dramatically increase the likelihood that vigorous local exchange competition will be economically viable and sustainable, with all the beneficial economic and social consequences that implies.
- They could choose the volume-sensitive reciprocal compensation scheme being proposed by the traditional local telephone companies to preserve the status quo, particularly their market dominance, **permanently**. If they do, it will dramatically increase the likelihood that local telecommunications services will continue to be the weak link in a state's "information infrastructure", with all the adverse economic and social consequences that implies.

The choice seems obvious: regulators must embrace volume-insensitive compensation arrangements, such as "bill and keep," to give effective local exchange competition a reasonable chance.

Price Structure Issues in Interconnection Fees

Gerald W. Brock

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(Prepared for Teleport Communications Group)

Summary

The interconnection of two communication networks provides a benefit to the customers of both networks by allowing customers of one network to communicate with customers of the other network. If traffic is roughly equal in both directions between the two networks, there is no need for either network to pay the other for interconnection. Each network can bill its own customers for their communications, and can terminate traffic received from the other network in exchange for the privilege of having its originating traffic terminated on the other network, an arrangement known as "sender keep all".

If traffic is primarily one way, it may be necessary for the company that is terminating the traffic to impose interconnection charges as compensation for the service it provides to the other company. If interconnection charges are imposed, they should be assessed at the long run incremental cost of adding capacity. The price structure should be a capacity charge per unit of time (as in private lines), not a minutes of use charge. A minutes of use charge causes inefficient calling choices and investment decisions and it would not occur in a competitive market.

I. Introduction

One important goal of regulation is to bring the results of a monopolized or partially monopolized market closer to what would occur under competitive conditions. Thus in considering the desirable price structure for regulated interconnection, the expected price structure under full competition is a useful guide.

The best existing example of interconnection under competitive conditions without regulation is the interconnection of commercial providers of Internet services. Because the Internet consists of many interconnected networks with relatively easy entry conditions and no regulation, it provides an example of a competitive network of networks. The growth of commercial services on the Internet and limitations on commercial products on the backbone network controlled by the National Science Foundation led to the formation of the Commercial Internet Exchange (CIX) in August 1991. Commercial Internet service providers agreed that interchange of traffic among them was of mutual benefit and that each should accept traffic from the other without settlements payments or interconnection charges. The CIX members therefore agreed

to exchange traffic on a "sender keep all" basis in which each provider charges its own customers for originating traffic and agrees to terminate traffic for other providers without charge.¹

The Internet example suggests that "sender keep all" interconnection arrangements are likely to develop in competitive communications markets as the compensation method for mutually beneficial interconnection arrangements. However, most telecommunication markets are not fully competitive. Incumbent telephone companies with market power have an incentive to use interconnection prices as a method of limiting competitive entry. Interconnection arrangements and prices have consequently been a major regulatory issue in the United States and other countries that have allowed competition in communications markets. Interconnection arrangements continue to be a critical factor in the viability of communications competition.

In November 1994, the European Commission released a study that it commissioned from a prestigious group of European and American telecommunication experts regarding issues of interconnection in an increasingly competitive telecommunication industry.² The study found that continued regulatory oversight of interconnection conditions would be necessary in order to allow effective competition to flourish. It recommended that interconnection rates be based on cost and set as a capacity charge. Specifically, the study concluded:

1. "If left to themselves, markets for interconnection services are likely to reflect either collusive arrangements or monopoly power of incumbent TOs [Telecommunication Operators]. In either case, interconnection prices are likely to be too high relative to prices that would emerge under competitive conditions."³
2. "We call for cost-based interconnection charges (based on MC_{IX} or AIC_{IX}) [marginal cost of interconnection or average incremental cost of interconnection]."⁴

¹ Padmanabhan Srinagesh, "Internet Cost Structures and Interconnection Agreements," in Gerald Brock, ed. Toward a Competitive Telecommunication Industry: Selected Papers from the 1994 Telecommunications Policy Research Conference (Hillsdale, N.J.: Lawrence Erlbaum, in press).

² J. Arnbak, B. Mitchell, W. Neu, K. Neumann, and I. Vogelsang, Network Interconnection in the Domain of ONP: Study for DG XII of the European Commission (Brussels: European Commission, 1994).

³ *Ibid.*, p. 69.

⁴ *Ibid.*, p. 84.

3. "The main costs associated with interconnection are for long-lived capacity. They therefore represent capital costs that are the sum of financing costs and loss in value of the capital goods over time. ...We consider capacity-based interconnection charges to be the optimal approach for interconnection between a sophisticated TO [Telecommunication Operator] and a sophisticated interconnector."⁵

The European Commission study's conclusions that telephone company incumbents will set *interconnection* prices too high without regulatory controls and that interconnection charges should be based on the incremental cost of capacity required by the interconnector are directly relevant to the development of competition in the United States. The principles developed in that study are designed to promote a dynamic and efficient telecommunication market and are applicable to the U.S. telecommunication market as well as the European telecommunication market.

This paper focuses on the importance of using capacity measures for interconnection rather than charges per minute of use. Specific conclusions with regard to the price structure for interconnection charges include:

- (1) Minutes of use interconnection charges would not be sustainable in a highly competitive market;
- (2) Minutes of use interconnection charges fail to attain efficiency and lead to incorrect investment signals;
- (3) Minutes of use interconnection charges have been used in the past as a convenient allocator for fully distributed cost under regulated monopoly, but are not appropriate for the emerging market structure of greater competition.

II. Competition and Interconnection Charges

We should expect to see "sender keep all" arrangements develop in a competitive communications market if either of two conditions are met:

- (1) Traffic flows are very roughly balanced among the companies so that each sees a clear benefit for its customers in both sending and receiving traffic from other companies; OR

⁵*Ibid.*, p. 92, 94.

- (2) The cost to a company of terminating traffic is low in relationship to the transactions costs of measuring and charging for traffic so that even with unbalanced traffic companies find the simple "sender keep all" approach superior to efforts to develop appropriate cost-based terminating charges.

In a competitive communications market, we should only expect to see interconnection charges when traffic is largely one way so that the receiving company is disadvantaged by "sender keep all" and when the costs of terminating traffic are substantial in relationship to the transactions cost of developing and collecting interconnection charges. Under those conditions, we should expect to see interconnection charges based on the cost of the capacity required to terminate traffic.

The most comprehensive public engineering study of the incremental cost of local telephone usage (and therefore of the cost of terminating telephone traffic for competitors) was done by the Incremental Cost Task Force with members from GTE, Pacific Bell, the California Public Utilities Commission, and the RAND Corporation.⁶ The Task Force had access to data for telephone companies in California and performed a detailed engineering cost study for various output measures of local telephone service. Individual components were priced based on 1988 prices and costs were computed for switch investment, switch maintenance, interoffice transport, and call attempt costs. All costs were computed for calls during the busiest hour of the year because the investment and associated expenses are related entirely to capacity cost. The Task Force computed the following usage costs for each hundred call seconds (CCS) during the busiest hour of the year for "average" and "larger urban" exchanges:

switch investment	\$5.00	- \$ 10.00 per year
switch maintenance	.20	- .50 per year
interoffice calling	.50	- .60 per year
Total	\$6.00	- \$11.00 per year

In addition, the task force computed a cost of \$.30 to \$.90 per year for each call attempt during the busiest hour of the year and estimated approximately 1.25 busy hour attempts per busy hour CCS.⁷

⁶Bridger M. Mitchell, Incremental Costs of Telephone Access and Local Use, (Santa Monica, CA: The Rand Corporation, 1990); reprinted in William Pollard, ed., Marginal Cost Techniques for Telephone Services: Symposium Proceedings Columbus, Ohio: National Regulatory Research Institute, 1991) (NRRI 91-6).

⁷*Ibid.*, p. 249, 250.

Price Structure Issues in Interconnection Fees

The task force found that all costs were related to the capacity of the facilities used and could best be expressed as costs per year for capacity, rather than as costs per minute or per call. Using reasonable assumptions regarding the distribution of traffic, the costs determined by the Incremental Cost Task Force translate into an average of approximately 0.2 cents per minute, but most of the minutes during a year impose no incremental cost on the local exchange because they occur at off peak times.

A simple but useful way of analyzing the competitive interconnection issues is to consider two separate communities, A and B.⁸ Each is served by a single telephone company, but entry and exit are easy ("contestable markets" in economic terms). The cost for each company of terminating traffic for the other is the cost of building a channel of adequate capacity for the peak terminating load between the two companies' switches. The size of the channel is a proxy for all of the capacity related costs in terminating traffic. As discussed above, if the traffic is reasonably balanced or if the costs of providing terminating service are low in relationship to transactions costs, it is likely that both companies will find it in their mutual interest to provide terminating service for the other and will provide it on a "sender keep all" basis without explicit terminating charges.

Consider the case in which terminating cost (the cost of the channel between A and B) is substantial and the terminating traffic is all one way from A to B. That is, customers of A wish to terminate traffic in B, but customers of B have no desire to terminate traffic in A. In that case, A will have to pay the cost of termination because B is not getting a reciprocal benefit. There are two ways to manage the termination:

- (1) A could build the channel to B if that were technically feasible.⁹ Then the cost of termination for A would be the capacity cost for the peak termination load.
- (2) B could build the channel to A (add necessary capacity to its local facilities) and charge A for using it.

If B offers a long term contract based on the cost of providing a given capacity, then the price structure will be similar to the cost structure that A would incur by building the capacity itself. Either ownership method would create an effective rental

⁸They are not necessarily physically distinct communities but are communities connected to particular communication networks.

⁹A simple channel would obviously be technically feasible, but the more realistic case in which terminating traffic requires an increase in capacity of B's switches, interoffice transport, and so forth might not be technically feasible.

price per time unit based on the capacity of the channel without regard to the actual number of minutes passing through it. However, suppose that B builds the necessary capacity to A and then decides to cover the cost with a charge per minute. Assume that the price per minute is determined by dividing the annual cost of the channel by the forecast number of minutes, so that B just covers its total cost. The price per minute will be higher than the true cost for off-peak usage and lower than the true cost for on-peak usage. That price structure would not be sustainable in a contestable market because a new entrant that offered prices more closely aligned with cost would attract all of the off-peak traffic. As the incumbent loses the off-peak traffic, its average price will no longer cover its cost and it will be forced to raise prices for the remaining traffic. The only sustainable price structure will be a cost-based charge related to the capacity of the facilities used to provide terminating service.

The reason why only capacity based charges would be sustainable in a competitive market can be clarified by considering the competitive market for rental automobiles. The cost of providing rental automobiles is more closely related to the time the car is rented than to the number of miles driven. Consequently, most rental companies charge by the time rented (day, week, or month) rather than by the number of miles driven. Charging by time for rental automobiles corresponds to capacity charges for interconnection while charging by miles driven corresponds to charges per minute of use for interconnection.

Suppose one rental company decided that all drivers should pay for each mile driven and set its rates as a price per mile rather than a price per day. Before customers adjusted to the changed price structure, the company could receive the same revenue with either method by simply setting the price per mile equal to the previous price per day divided by the average number of miles per day. However, that price structure could not last in a competitive market. It would cause those who drive long distances per day to pay far more than those who drive short distances. Because the real costs are related to the time the car is rented rather than to the number of miles, another company would offer a flat rate with unlimited miles and attract all of the long distance drivers. The company charging per mile rates would be left with only those who drive very short distances and would no longer cover its cost with the initial rates. As it raised its rates per mile in order to covers its cost, it would lose additional customers and eventually it would be forced to impose a cost related time charge in order to stay in the competitive business. Similarly, a competitive communications company would be forced to impose a cost related capacity charge rather than a minutes of use charge in order to survive in a competitive communications market.

III. Monopoly and Interconnection Charges

If the company providing interconnection services has a monopoly, then interconnection charges per minute of use will be sustainable because there is no competitive pressure to price in accordance with cost. However, interconnection prices based on minutes of use will not lead to maximum efficiency. They will distort both consumer decisions and investment decisions because they provide the wrong price signals.

Minutes of use pricing has been used extensively in the monopoly telecommunication industry of the past. Pricing on a minutes of use basis was mandated in the federal access charge plan. The access charge plan created in preparation for the January 1, 1984 divestiture of AT&T created a rigid structure of the prices to be paid from interexchange carriers to local exchange carriers for originating and terminating interstate traffic. Particular categories of cost determined by prescribed cost allocation procedures were required to be recovered by dividing the cost category by the forecast number of minutes and charging interexchange carriers the resulting price per minute for the access element.¹⁰

Although the per minute access charges were sustainable because of the largely monopoly structure of the local exchange industry, they distorted both consumer and business decisions away from maximum efficiency. On the consumer side, the access charges made it expensive for long distance companies to serve off peak residential customers. Long distance companies paid the same rate per minute to local telephone companies for traffic terminated late at night as they paid for traffic terminated at the peak of the business day. Consequently, discounted consumer rate plans for night calls that were established prior to the implementation of access charges became unprofitable. Long distance companies were forced to raise their prices to night time residential callers because of the artificial access charge structure even though the night time calls (utilizing otherwise idle capacity) imposed practically no cost on either long distance or local exchange companies.

Prior to the implementation of the federal access charge plan, an interim plan for initial long distance competition imposed access charges on long distance providers based on capacity used. That plan provided incentives for carriers such as MCI and Sprint to aggressively develop their residential customer base because residential calls were

¹⁰The legal description of the access charge plan is found in Title 47 of the Code of Federal Regulations, Parts 36 (separations cost allocations) and 69 (computation of access charges). An account of the political and economic issues related to access charges is contained in Gerald Brock, Telecommunication Policy for the Information Age: From Monopoly to Competition (Cambridge, MA: Harvard University Press, 1994), chapters 10 and 11.

primarily off peak and imposed little or no cost on the companies. Once the access charge plan was implemented with its per minute charges for all traffic regardless of when it occurred, the companies found that business traffic was more profitable than residential traffic. The incentives created by the minutes of use access charges thus distorted business marketing and investment decisions away from the efficient path.

The pernicious efficiency and investment effects of minutes of use interconnection charges can be illustrated by considering a regulated monopoly automobile rental company. If it (or its regulator) decides that charges should be determined by the mileage driven rather than by the time the automobile is rented, the resulting rate structure will be sustainable and can be designed to allow the company to recover its total revenue requirement. However, consumers will have an incentive to rent many cars for occasional short mileage driving. If the company is required to provide rental cars at the established rate to all who request them, it will be forced to make large investments in underutilized capital. It will recoup the costs of the investment by imposing very high charges on the long distance drivers.

The monopoly rental company will report to its regulators that it is subsidizing short distance drivers who are being provided cars below cost. Both the company and its regulators will be concerned about any proposals for competition because competitors would "cream-skim" the profitable long distance drivers, leaving only the unprofitable short distance drivers to the regulated company and threatening its viability. However, the entire problem is simply that the price structure does not correspond to the cost structure. The distortions and regulatory problems could be solved by shifting to a time based rental structure that matched the structure of cost in that market. Similarly, minutes of use access or interconnection charges reduce efficiency, create wrong investment incentives, and increase the difficulty of moving toward a competitive communications industry.

IV. Conclusion

Several conclusions can be drawn from this analysis:

- (1) The interconnection of two communications networks provides a benefit to customers of both networks;
- (2) The commercial providers of competitive non-regulated Internet service have recognized the mutual benefits of interconnection by agreeing to interconnect on a "sender keep all" basis, terminating traffic originated by others in exchange for having their originating traffic terminated by others. This is a useful model for